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ROSELLE FIBRE.

By E. Mathieu.

IN a paper which appeared in the *Gardens' Bulletin* (Singapore) of 12th April, 1920, the Roselle plant was considered simply as a raw material for making of jam, jellies, etc. Of the two varieties therein referred to—viz.: *Hibiscus sabdariffa* var. *Victor* and *H. Sabdariffa* var. *Altissima*, it was found that the sepals of the latter fruit, besides being smaller in weight than those of the *Victor* family, were characterised by a marked hairiness which made them unsuitable for jam making, for which only the sepals may be used. But the bearing of the bush, with its profuse branching in single undivided whip-like sticks, suggested the possibility of turning the bast into fibre. A few of the sticks were cut out and the bast stripped into thongs which were found to be very strong, but, for want of knowledge of the proper method of treatment, no attempt was made to extract the fibre from the bast, except by ineffective scraping which only resulted in a mass of tow.

Seeds were however collected of the *Altissima* variety and a fresh plot planted out at the end of 1919. The result obtained from this plot will appear below.

Soil and Weather Conditions.

Roselle which has been cultivated in the Economic Gardens for over three years under widely different conditions of soil, from a sandy alluvial loam on a low, slightly peaty bottom, to a stiffish yellow clay at the foot-hill, has done well in both cases, but it appears to make a thicker stem and to grow faster in a fairly light loam; in more compact soils, it also requires deeper diggings to afford easy penetration to the long tap-root, and more frequent forkings between the rows, to keep the soil in a well aërated condition. But as stated, its growth, if slower in stiffish clay, is nevertheless satisfactory. And here it may be noted that slower growth rather favours the production of strength in fibre, and in countries like Singapore and the Malay Peninsula, generally, where heat and moisture are favourable to rapid growth, it may be that a somewhat heavy retarding clay soil would prove, ultimately, a better medium for the growth of fibrous plants, than lighter sandy soils.

Method of Planting.

Roselle stands transplanting very well, and the plants should be raised in nurseries in order both to save seed and to allow of selection among the seedlings. The seeds, however, unless they are fresh, do not germinate easily—in the case of seeds which had been stored some time, the writer found it necessary to germinate them between wet cloths or between sheets of blotting-paper kept moist. The nursery beds must be well watered, but, at the same time, perfect drainage must be assured as water-logging is very injurious to the young plant. When about 6 inches high, the seedlings can be transplanted to their permanent place in the fields, but going by his own experience, the writer would advise pricking out into new beds until the plants have reached 10 to 12 inches in height, and then a final transplanting to the fields. Transplanting seems to strengthen the root system of the Roselle plant, and, although a droop of its leaves is apparent for a while, it starts growth again with increased vigour after three or four days. This method implies, of course, well worked beds, effective drainage, and careful handling of the plants—in a word, it implies thorough cultivation.

The sowing of the beds should take place about one month before the rainy season begins, the beds being liberally watered at the time of sowing, and, rain failing, twice a week afterwards. The first pricking out may take place shortly after the rainy season has begun, the second and final transplanting taking place when the plants are 12 to 15 inches high and the rainy season at its full. If sown in September, for instance, the plants will have made a good start in the nursery beds, and the November rain coming at the time of transplanting in the fields, will hasten growth until February when the dry whether will forward maturity.

Planting Distances.

The distances adopted in planting the plot of 120 trees of *H. Sabdariffa* var. *Altissima* presently under review, was 4 feet in all directions. But as will be gathered from the photographic plate accompanying the paper previously mentioned, the habit of the plant is to throw out its whip-like branches at a very acute angle to the main stem, so that, even at the period of full growth, when the stems had attained a height of 12 to 16 feet, there was still a space of 1 foot clear between the branches of any two neighbouring trees. Planted 3 feet apart the branches would have just touched. Such wide planting is therefore a waste of ground. Planting 3 feet apart, on rows 3 feet apart, while reducing the weeding costs and increasing fibre output, would afford sufficient space for the normal development of the branches to a length of 5 to 6 feet, when they are most fit for fibre purposes.

(These remarks apply to the variety "*Altissima*" only. In the case of the "*Victor*" variety, where the contrary conditions prevail of wide horizontal branching, 5 feet in all directions must be the rule: but that variety is not here under consideration.)

It is even a question whether the system of close planting followed by Dr. Roxburgh, more than one hundred years ago, is not the most likely one to give the best results, both financially and in point of view of quality of the fibre.

Dr. Roxburgh, quoted in Boyle's "*Fibrous Plants of India*" observes of Roselle fibre:

> "The bark abounds in flaxen fibre, but in none have I found so large a quantity of equally beautiful, long, glossy white and strong fibre as in this. To these promising qualities may be added the luxuriant growth, and habit of the plant, rendering it an object deserving of every care and attention, at least until the real worth of the material is fairly ascertained. From several years experience, I find the best season for sowing the seeds in Bengal is just when the first rains begin, which is generally in May, in beds, and, when the plants are about 6 inches high, transplant them out in rows about 9 inches as under and about as much from each other in the rows. In 1801, I had 40 square yards planted in this manner, which yielded 33 pounds of the naturally very clean fibre."

Incidently, the yield here recorded by him would, allowing 10 per cent. for alleys and drains, amount to close on 3,600 pounds of fibre to the acre.

Following, at a distance, the method advocated by Dr. Roxburgh, the writer planted a second plot of *H. Sabdariffa* var. *Altissima* in the proximity of the first plot which was planted, as already stated, at distances of 4 feet. This second plot was sown in January 9th and finally transplanted 12 inches apart on rows 18 inches apart; on the 30th of June, the plants had obtained a height of from 5 to 7 feet; but unfortunately, the writer having received an appointment elsewhere, the experiment was not carried out through to the end—*i.e.*, to the fibre-making stage, except in one case, recorded below, when 12 stems were found to give $2\frac{1}{2}$ ounces of dry fibre.

No conclusions can therefore be drawn from that trial; but the contrast in the bearing of the plants in the two plots was striking and instructive. For convenience sake we shall call the plot under wide-planting—*i.e.*, $4' \times 4'$ Plot A: that under close planting $12'' \times 18''$ Plot B.

The bushes in plot A, at eight months, had attained a height of 14 to 15 feet and every bush bore between 25 to 40 branches ranging from $5\frac{1}{2}$ to $6\frac{1}{2}$ feet long; these branches were single sticks without secondaries and with very few leaves: the diameter of the stems varied from 1 to 2 inches, that of the branches from $\frac{1}{2}$ to $\frac{3}{4}$ inch, tapering to $\frac{1}{4}$ inch; except for the 4 to 5 inches of the growing end which remains tender and succulant, the whole of the bast is fibrous.

The plants in B did not form into a bush but grew mostly into a single stem without branches or with 2 or 3 branches of a herbaceous nature. Where however, space allowed, as for instance, along an alley or along a drain, or at the end of the rows, the plants were found to bear many more branches of a more or less woody consistency.

Briefly, we have in the one case, A, abundant branching and in the case of B, sparse branching or none at all. This is in accordance with the natural effects of wide as opposed to close planting. In wide planting, exposure to air and light favours the formation of wood, whereas in close planting, opposite conditions—*i.e.*, exclusion of air and light, produce opposite effects—*i.e.*, scarcity of wood.

The question is: where lies the happy medium which will secure the maximum results in quantity and weight of fibre with the shortest period of vegetation?

We have seen that planting *H. Sabdariffa* var. *Altissima*, 4 feet by 4 feet, as carried out by the writer, in one instance, is a mistake. The results of such planting which are here given make this plain.

An acre planted 4′ × 4′ contains 2,700 trees; the number of branches on the full-grown trees was found to be 25-40 or say an average of 32 branches from $2\frac{1}{2}$ to $6\frac{1}{2}$ feet long—*i.e.*, 86,400 fibrous sticks.

The following results were obtained from two bushes which had been broken at ground level overnight in a storm; but it should be premised that the two trees had previously supplied 5 branches 5 feet long (one tree 3 branches, one tree 2 branches) for an experiment in fibre extraction. These 5 branches will have to be taken into account.

In the present experiment the branches were cut at their base on the two stems; then they were stripped of leaves and their herbaceous tops cut off. The leaves and tops weighed 5 pounds. There were:

	lbs.	ozs.
A.—28 branches from 5 to 6 feet weighing without leaves	5	0
B.—14 „ „ 3 „ 4 „	0	14
C.—20 branchlets „ 2 „ $3\frac{1}{2}$ „	0	8
D.— 1 stem „ 13 „ 14 „	3	9
E.— 1 „ „ 13 „ 14 „	3	7
Total weight of branches and stems was	13	6

The weight of the fibre content was:

A.—$3\frac{1}{2}$ ounces.

B and C.—1 ounce.

D.—$2\frac{1}{2}$ ounces.

E.—3 „

Total weight $9\frac{3}{4}$ ounces.

Adding half an ounce of fibre for the five branches cut previously to the present experiment, we get a total of $10\frac{1}{4}$ ounces of dry fibre obtained from the two plants. As there are 2,700 plants to an acre planted 4′ × 4′ we would get for one acre 865 pounds of fibre.

Bearing in mind, however, that the two trees here dealt with were destroyed by a storm, this figure is not quite correct; for the branches on a tree do not mature all at the same time; while the lower ones, having attained their full length, 5 to $6\frac{1}{2}$ feet, may be fit for fibre making, the upper branches may have attained only half their normal length and be still in the herbaceous stage of growth.

Thus the harvesting must be done intermittently, that is to say, it must be regulated by the stage of growth of the branches, and it will be readily understood that a marked difference of output would result if all the branches of each tree or say 25 of them (taking lowest average) were allowed to reach their full development. The fibre output would then be somewhat as follows :

A and B	each 25 branches 5—6 feet=50 branches yielding	$5\frac{3}{4}$	ounces of fibre
D and F	„	$5\frac{1}{2}$	„ „
Total ...		$11\frac{1}{4}$	„ „

The acre yield would then be 2,700 trees multiplied by 5.625 ounces=950 pounds. But against this increases of output would come the increase of expense on account of intermittent harvesting.

At the present time (September, 1920) of high prices, such an output might possibly pay its way, the crop (under intermittent cropping) being a nine to ten months' one ; but in normal times, with wages all round on the rise, it would most probably mean a loss to the planter.

So much then, for planting of *Hibiscus Sabdariffa* var. *Altissima* at 4′ × 4′. But planting as we advocate 3 feet in all directions, puts a better complexion on the venture. Allowing 10 per cent. for alleys and drains, this would give 4,400 trees to the acre with 25 branches each (at the lowest) ; each tree bringing in 5.625 ounces of fibre, the acre output would be 1,547 pounds of dry fibre.

We may now examine the prospects of Roselle fibre cultivation under quite close planting—*i.e.*, 9 inches apart, as advocated by Dr. Roxburgh, which, in fact, brings us to the practice followed in the planting of jute, which in Purnea (Bengal) is sown broadcast and then thinned out, in two thinnings to 6 inches.

At 9″ × 9″, the acre, allowing 10 per cent. for alleys and drains, contains 70,500 plants, growing branchless, except just at the top. Under such conditions, the growth upward of the stems is rapid, and in 4 months, in a normal season, just before the plants flower, they should be ready for cutting, when they have attained a height of 6 to 7 feet or more. The taller the plant of course, the higher the yield. In the one case in which he had occasion to treat the fibre of stems taken off the plot planted 12″ × 18″, the writer found that 12 stems 5 feet long gave $2\frac{1}{2}$ ounces of clean dry fibre. The acre yield of fibre would, at this figure, be 910 pounds.

But it should be remarked that in this case, the stems were not cut at their full length and the yield was thus considerably lowered. Although he was unable to repeat the experiment on full grown and mature stems, the writer is of opinion that a yield of 1,250 pounds to the acre may be confidently reckoned upon, and if it is borne in mind that the crop is a four months one, that the expenditure of cultivation, of harvesting and extraction of the fibre is not a high one, there ought to be a fair margin of profit, even at pre-war prices for this class of fibre.

It will be seen that the results here shown fall far short of those recorded by Dr. Roxburgh—*i.e.*, 3,600 pounds per acre. Perhaps his figure refers to two, or even three crops obtained during the course of one year. Perhaps, also, manuring was resorted to, which the writer knows, is wonderfully effective with this crop.

Cultivation.

The soil needs to be well broken to a depth of 8 inches, and free from weeds before planting out, so that the plants may make a good start before the weeds reappear with the coming rains. One weeding will be necessary before the plants are finally established; no further work is required before harvesting.

Harvesting.

As soon as the flowering buds appear, harvesting should begin, as the fibre is then at its best. The plants are cut down at the ground surface, with a "parang" or with a well-sharpened sickle, and as he proceeds, the workman lays the cut stems on the ground behind him; the stems remain two or three days on the ground for the leaves to wither and fall off. Passing over the field a second time, the cooly assembles the stems in bundles of about 25 to 30 leafless stems, tying them with a stip of bast taken from a stem.

These bundles are brought to the retting-pool and thence forward the process is the same as that obtaining for jute or flax as carried out in India and in Europe.

Retting.

The stems of "*Hibicus*" consist of an inner woody core and of the bast containing the fibres covered by a cuticle and cemented together by a slimy, glutinous gum. These constituent parts adhere and in their natural state they are not easily separated; but by steeping them in water at the ordinary temperature of the tropics, for a more or less prolonged period the gum gradually dissolves; disunion takes place and the formerly adhesive parts may then be separated. Such is the aim of retting, a fermenting process which is quickened by suitable temperature of the water and also by the presence of bacteria in stagnant water. When pulling out the Roselle stems from the steeping water, a strong and unmistakable smell of curdled milk is emitted which indicates the presence of butyric acid. This agrees with the accepted theory of flax-retting which has long been recognised as due to butyric acid fermentation.

The bundles of stem, brought to the retting-pool, a pool of about 12′ × 18′ and 4 feet deep, are placed in the water, the thick end downward, and in a sloping direction, and immersed by means of weights, stones or planks.

The period of immersion varies with the temperature; a high temperature hastening the retting process, but care must be taken that the process is not unduly prolonged, as over-retting weakens the fibre, destroys its gloss and dissolves it. But it is impossible to fix a hard and fast rule about the length of the retting process; the writer has tried stripping the fibre after different periods of steeping.

After 15 days the slimy gum was wholly dissolved, but the fibre produced was not pure white, but greyish, turning almost to black at the thick end of the stems and lacking in lustre. After eight days steeping, the operation of stripping was quite easy and the product was of high quality. A good fibre, but not quite free from pellicle was, to the writer's astonishment, obtained from a small lot of 12 branches which was stripped after 4½ days steeping: it was during a period of very hot weather from 28th May to 1st June and in a very shallow cemented tank. The result, a white and glossy sample, was sent to the Imperial Institute, London, with a request to give an opinion on it as raw material for paper making.

Professor Wyndham R. Dunstan, Director of the Institute, was good enough to submit the following information:

> "*14th July, 1920.*—The sample consists of well-prepared fibre about 4 feet long of good colour and lustre and excellent strength. Such fibre is much too valuable for paper-making it would be suitable for spinning either alone, or in conjunction with jute, and would probably realise a price approximating to that of first marks Bengal jute, which is now quoted in the London Market at £45 per ton. If such fibre could be offered in commercial quantities, it would meet a ready sale in the United Kingdom."

The length of the process of retting depends much upon the temperature of the water, (heat hastening, cold retarding the dissolution of the gum), upon the softness or hardness of the water and upon the age of the plants at the time of cutting. The best way to avoid over-retting is, after the sixth day occasionally to examine one or two of the bundles to ascertain if the stems are fit for stripping.

The following summarised instructions issued by the Flax Society on the retting-pool are clear and instructive:

> "River water is the best. If spring water is used let the water settle for some weeks in a pond, so that the action of air and sun may soften it. Water containing iron or other minerals should not be used. A pool 12′ × 18′ and 4 feet deep is enough. Place the bundles in one layer close together somewhat sloping, the root-end down. The bundles must be kept under water by weights.
>
> "A small stream of water, allowed to run through has been found to improve the colour. If the pools are in one line, the stream should be conducted along the one side and run into each pool separately, and the water of each pool run off, along the opposite side in a similar manner.
>
> "It will be sufficiently steeped in an average term of 8 to 14 days, according to temperature and the nature of the water.

"A few hours too much steeping may injure the fibre. To find out if the sticks are under or over-watered, try the following experiment. Break one or two sticks in their middle and if you find the broken bit pull freely out downward, without breaking or tearing the fibre, and with none of the fibre adhering to it, it is ready to take out. Have the bundles handed out on to the bank by men, standing in the water, place them on their root-ends to drain for 12 hours, or they may also be placed on the bank sloping but the heaps must not be too large in order to avoid fermentation."

Keeping in view the difference of climatic conditions, these instructions apply, to the letter, to the retting of Roselle, although the writer has not found it necessary to drain the bundles after retting, the stripping taking place immediately on lifting the sticks out of the water.

Stripping of the Fibre.

As soon as by rubbing a stick or two with the fingers, they are found to have lost their slimy feel, and the bark separates readily from the woody core, retting may be considered as complete. The coolies entering the pool, take hold of the bundles and remove them to the shallower end of the pool, where the stripper stands in about two feet of water.

The latter then takes a handful of stems, about 10 to 12, beats the thick ends on a length of about 6 inches with a wooden mallet, the ends resting on a wooden block close to his hand. A few strokes of the mallet suffice to loosen the fibre at the thick ends. The stripper, then taking a good grip of the loose ends proceeds vigorously to beat the sticks on the surface of the water. After three to four minutes of such beatings, varied by a forward and a backward, push and pull movement through the water, the fibre is free both of pellicle and of woody core; or else the beating process can be shortened by the operator holding the thin end of sticks with the left hand, and with the right, drawing the sticks out whole from their fibrous sheath, just as a sword is drawn from its scabbard.

After receiving a good rinsing in clean water, the fibre is suspended on bamboo to dry. As may be judged from this description, the process is of the simplest and requires no mechanical contrivance of any kind.

When dealing with very long stems, over 6 feet in length, the stripper, taking hold of the sticks in the middle, gives them a twist at that spot so as to break the inner wood, without breaking the fibre and, gripping the sticks at the point of the fracture with both hands, whirls them round his head and brings them down with great force on the water, repeating the beating process just described.

Exposure to sun and wind for one day is sufficient to dry the fibre ready for shipment. But it is preferable to give the fibre the benefit of one or two nights' dew to perfect the bleaching.

The writer having personally treated only small quantities of fibre, cannot say from actual practice what output of fibre a stripper can put through in one day. In Purnea (Bengal) a skilled stripper strips 49 pounds of jute in six working hours: an untrained man does half that amount.

Estimated Cost of Cultivation.

Given a land suitable for the growing of Roselle Fibre—a land which could be cleared and drained at a cost of, say, $20 per acre, the total expenditure necessary for the cultivation of Roselle Fibre may be estimated as follows:

Clearing and draining	$ 20.00
Two changkollings	25.00
Two rakings	6.00
Seed 8 pounds	4.00
Nursery beds and watering (say for 20 acres at per acre)	3.00
Two weedings	6.00
Harvesting, bundling and bringing to the retting pool: 4 men two days	4.80
Stripping and watering. 1,250 lbs. of fibre at 30 lbs. per coolie day	25.00
Baling—Pressing and freight to port of shipment	15.00
Total expenditure ...	$108.80

The expenditure on subsequent crops would be reduced by the cost of clearing; but manuring would take its place. A good deal of the work, however, being of a light nature (weeding, nurseries, harvesting) could be done by women at a lower rate of wages.

Against the above expenditure of $108.80 the product of an acre—*i.e.*, 1,250 lbs. at £30 per ton would rank at £19 10*s.* 7*d.* at 2/4 = $167.00.

In Purnea in 1917, the estimated cost was put at Rs. 65 per acre for a crop of jute of 15 maunds per acre of a value of Rs. 120. bearing a profit of Rs. 55 to the cultivator the price of Rs. 120 is for the raw dry fibre, the buyers having their own presses.

Conclusions.

Having now said all he has to say about fibre, the writer would beg leave to put before his readers his views on this crop, which he looks upon as a possible new staple of industry for this country.

He was, greatly impressed by its adaptability to this country, and its soil and climatic conditions, by the unexacting nature of its cultivation, by the rapidity and luxuriance of its growth, and above all, by the ease of its transformation into a finished product of trade.

India has created the great jute industry, and a low rate of wages has long given her a monopoly of the jute trade. On the other hand, her great alternations of dryness and moisture; her complete dependence on the monsoon which, no further back than 1916, is reported to have damaged greatly the jute crop by an early break, are adverse conditions, from which Malaya is almost free; and now that the scale of wages in India is gradually approximating to the level of Malaya, it is a question whether the time has not come for the planters of this country to turn their attention to the cultivation of the fibrous plants and amongst them, to that of "*Hibiscus Sabdariffa*" var. *Altissima*,

Of the intrinsic nature of the fibre there can be no doubt. At the Sourabaya Congress of 1912 it was stated that Roselle Fibre was from one half to two times as strong as Indian jute, and the opinion was expressed that Roselle has a wider range of uses than jute.

Sundry tests made in Java have established the usefulness of this fibre for industrial proposes, and its value as an article of commerce.

Unfortunately Roselle Fibre, though not unknown, has only appeared fitfully in the London market, and in small quantities, sometimes under the name of "Roselle Hemp", sometimes under vernacular names, and to this fact is partly due the ignorance of the manufacturers as to its real merits and the many uses to which it may be put.

But the difficulty of introducing and pushing a little known product of any kind, and especially fibre, on the markets of the world is great, the manufacturers before they will look at it, require that the product be forthcoming in great and regular quantities, which puts on the planter the risk of the venture, and it has happened before that he has burnt his fingers in it—Ramie, to wit.

Could, however, a manufacturer or two be induced seriously to enquire into the real worth of this fibre, and give it a fair trial by subjecting it to practical treatment and working in their factories, small trial shipments might be made at regular intervals until, satisfied that it answers the requirements of his industry, he would be ready to absorb the production of an estate. Others would then perhaps follow suit and a new industry would be born.

(*Reference*: *Royle's Fibrous Plants of India, Agricultural Journal of Department of Agriculture, Behar and Orissa, 1917.*)

REPORT ON ROSELLE FIBRE.

SINCE Mr. Mathieu wrote his article on Roselle Fibre, which appears in this number of the *Agricultural Bulletin*, the following report, dated October 29th, 1920, has been received from Professor Wyndham R. Dunstan, Director of the Imperial Institute, on further samples of fibre which were submitted to him.

"Samples A, B and C, consisting of cream-coloured fibre from the side branches, were well prepared, fairly soft and lustrous, and of good strength. They were generally similar to the sample which you previously forwarded but were not so pale in colour. Sample A was chemically examined at the Imperial Institute with the following results, which are shown in comparison with the corresponding figures recorded for *H. cannabinus* fibre (Bimlipatam jute) from India:

	Present sample A. per cent.	Bimlipatam jute. per cent.
Moisture	10.9	12.5
Ash	0.8	1.3
(*a*) Hydrolysis, loss	10.0	11.8
(*b*) Hydrolysis, loss	13.4	15.1
Acid purification, loss	0.3	—
Water-washing, loss	0.1	—
Cellulose	78.0	75.4

These results confirm the view that the fibre from the side branches is suitable for spinning, either alone or in conjunction with jute, and that if ordered in commercial quantities it would meet with a ready sale in the United Kingdom at a price approximating to that of first marks Bengal jute, which is now realising £49 per ton in London (October, 1920.)

Samples D and E, representing fibre from the main stem were under-retted and imperfectly prepared. They were coarser and less lustrous than A, B and C, cream to reddish brown in colour and were badly broken in many places. A quantity of adherent bark was also present. Fibre of the quality of these samples would have only a low value, and its production is not likely to be remunerative. Even if well prepared its value would be below that of the fibre from the side branches.

With reference to your observations regarding the preparation of the present samples in stagnant water and your suggestion that it would be better to ret the material in clean moving water, it may be pointed out that, as the removal of the gummy matter is due to the action of bacteria, a rapid flow of water would be unsuitable for the process. If therefore moving water is employed it should be in the form of a sluggish stream, as in the method adopted for retting flax in the Courtrai district of Belgium."

CERTAIN HOST PLANTS OF FOMES LIGNOSUS AND USTULINA ZONATA.

By F. W. South.

1.—FOMES LIGNOSUS ON BAMBOO STUMPS.

IN May, 1920, a visit was paid to a Chinese estate in Selangor, part of which consisted of a clearing about 50 acres in extent planted with rubber, of which the oldest trees were about $2\frac{1}{2}$ years old. The trees were, however, of very irregular sizes owing to supplying necessitated by attacks of *Fomes lignosus*. An area of about 20 acres had been especially badly damaged. This area lay on the slope of a small hill with a gentle fall along the width of the block : on the lower side, however, there was a ravine about 20 feet deep the steep side of which was planted with rubber. The soil of the whole clearing was a yellow sandy loam fairly rich in humus of the kind which admits air freely to some depth and is very porous. Previous experience with such soils has shown that, while they are suitable to the growth of rubber they are also very suitable to the spread of *Fomes lignosus* particularly in districts with a heavy rainfall such as that in which this estate is situated. *Fomes* spreads very freely through these light soils and can also penetrate to unusual depths ; it has been found as much as 4 feet down the main root of a rubber tree in such a soil. When there is plenty of decaying wood in these soils the strands of the fungus attain a large diameter, being often as thick as a man's little finger, and run to considerable distances in all directions through the soil, usually in the upper 3 or 4 inches.

On the estate in question there were numerous jungle stumps of various sizes and especially the stumps of a large bamboo ; these last were fairly numerous. The badly effected area was covered with sweet potato for food production purposes ; this was planted on banks between the rows of rubber trees and nearly covered the whole area.

Many of the rubber trees in this badly affected patch were dead and showed a thick growth of the mycelium of *Fomes lignosus* extending quite two feet down the main roots. On a few trees fructifications were found on the damp bases of the trunks among the sweet potato leaves. The soil was so permeated with fungus that supplies were almost immediately attacked and hardly ever made a start. Stumps were found with the whole length of the root to the soil level covered with mycelium although the stumps had only been planted quite a short time previously. The mycelium of the fungus also showed on most of the jungle stumps.

The specially interesting feature, however, was the condition of the bamboo stumps. In each clump there were several stumps each from one to two feet high and consisting of one or two complete joints with the cross walls remaining at the nodes. On splitting open several such stumps it was found that the uncut joints contained water and a mass of Fomes mycelium which practically filled each joint, so that the appearance was like a tube culture of the fungus.

The outsides of the clumps were covered with mycelium and strands of the fungus, while above the soil, in the shade of the sweet potato leaves, fructifications of the fungus in all stages of development could be found practically on every clump.

On the sweet potato tubers and stems a fine white mycelium closely resembling early stages of *Fomes lignosus* could frequently be found. Unfortunately the absolute connexion of this mycelium with the strands of *Fomes lignosus* could not be established, but there was little doubt of the identity of the mycelium on the tubers.

It was certain that the spread of the fungus had been much assisted by the presence of the felled bamboo clumps, while the presence of the sweet potato cover appeared also to encourage its growth, partly by affording a food supply for the mycelium, and partly by maintaining moist conditions in the surface soil and around the bases of the infected bamboo clumps, jungle timber and rubber trees.

2.—BLACK LINE FUNGUS (USTULINA ZONATA.)

On "Pinang" Stumps (*Areca Catechu*)—A new host plant.

During the month of September, 1920, a visit of inspection was paid to small holdings in the "mukim" of Pagoh on the southern or left bank of the Muar River in Johore. These holdings are of some age and were all originally planted up with "Pinang"—(*i.e.*, Areca Nut) palms.

Subsequently, rubber was planted through these holdings and at different times the palms, or some of them, were cut out. On many holdings the palms were allowed to remain until recently when the Agricultural Department gave orders for their removal, to reduce the over-crowding, as part of the preventive treatment for an outbreak of Mouldy Rot. On some holdings the palms still remain. In addition to the planted "Pinang" and rubber trees, the holdings were often overgrown with fern and other undergrowth to such an extent that it was difficult to penetrate them. On many holdings the undergrowth too, had recently been cleared, also in accordance with instructions from the Agricultural Department. The land is all flat, being near the bank of the river, and the soil is heavy clay.

On one holding where the "Pinang" trees had been felled some few months previously and the undergrowth had recently been cut down, four "Pinang" stumps were found close together showing a vigorous development of the fruits of the black line fungus *Ustulina zonata*. The stumps were about three feet high and were covered with these fructifications all down one side. On cutting into the stems the characteristic black lines were seen beneath the fruits, and the tissues were found to be dry and light in weight. The weather was wet at that time, so that the general conditions were very damp, a factor which favors the production of these fructifications. About three weeks of rainy weather had followed a period of drought lasting two months or more.

This is believed to be the first record of this fungus on this host plant; it is certainly the first record for Malaya and no record for any other country where the fungus occurs has been noted.

DISEASES OF THE OIL PALM IN WEST AFRICA.

WHILE there is a considerable amount of literature dealing with diseases of the coconut palm, some of which, as bud-rot, are very destructive, very little is known of diseases and pests of the oil palm. Hitherto, in fact, this palm does not appear to have suffered greatly from the attacks of insect or fungoid enemies, no doubt largely because in West Africa, even if not indigenous, it appears to enjoy optimum conditions of soil and climate. During the past few years, however, various records of diseases of the oil palm in West Africa have accumulated. It may be that with the increasing economic importance of the plant more attention is being paid to injurious parasites. On the other hand, it is quite possible that the parasites which attack the coconut and certain other palms are at length adapting themselves to the oil palm, and if so it is important for the oil palm industry that attention should be called to this source of danger.

Information is as yet very incomplete, but it is hoped that a summary of such facts as have come to the knowledge of Kew may serve to draw attention to the matter, and lead to an extension of our knowledge.

Good specimens of fungi suspected of attacking the oil palm and photographs of typical diseased palms, together with as many observations as possible as to method and conditions of attack, would be most welcome in this connection.

I.—Rot of Trunk due to Ganoderma sp.

In 1915 a report was received from Messrs. Lever Bros, concerning a fungus attacking oil palms on their estate at Leverville, Congo. Specimens of the fungus were sent, and although it was obviously a *Ganoderma*, near to *G. lucidum*, the material was unfortunately too old and decayed for specific identification. As far as could be judged it seems to agree best with *G. tumidum*, Bres.

This fungus was stated to be very common in the district and widely distributed. It attacked the base of the trunk and was most frequently seen on mature trees, but was also observed to attack and kill young trees. After the death of the tree the fungus persisted for an indefinite period as a saprophyte, thus providing a continual source of infection. Moreover, when the roots of dead trees were "grubbed" out it was noticed that much mycelium persisted in the soil. In the same report it was mentioned that certain species of beetles bore holes into the base of the palms, and many provide access for the spores.

No further information was obtained as to this case, but in 1917 the late Mr. C. O. Farquharson, Mycologist for S. Nigeria, reported that he had found a few oil palms at Awka and Agwoba dying from attack by *Ganoderma lucidum*, Karst. (*Fomes lucidus*, Fr.) They were old trees, and had probably been weakened by tapping for wine; he did not consider there was any likelihood of the fungus becoming epidemic.

This fungus, *G. lucidum*, also attacks the coconut palm, the areca palm, and probably others, and is a common saprophyte all over the world. It seems to be only an occasional wound-parasite, but even so it may possibly cause considerable loss in districts where it is abundant.

Recently notes and photographs have been received from Mr. R. Swainson Hall, of Cabinda, Portuguese Congo, of a disease on oil palms there caused by a species of *Ganoderma* which he also regards as *G. lucidum*. This fungus causes a rot of the internal tissues near the base of the trunk, and is said by Mr. Swainson Hall to be very destructive.

In *L'Agronomie Coloniale, Vol. IV, No. 30, 1920, pp. 187-191*, Maublanc and Navel have described a similar disease of the oil palm in the islands of San Thome and Principe, off the West Coast of Africa. The fungus causes a rot, and eventually produces a large cavity at the base of the trunk. In this case the causative agent was identified by Patouillard as *Ganoderma applanatum*.

From these various records it is obvious that there is widely spread in West Africa a trunk-rot of *Elaeas guineensis* due to a species of *Ganoderma*. There is some doubt as to whether one or more species of *Ganoderma* is concerned. The names *G. tumidum* (?), *G. lucidum*, and *G. applanaum* have been applied, but, *a priori*, it would seem more probable that only one species is really parasitic. It is very desirable therefore that the fruit-bodies of any fungi suspected of causing disease, when in good condition, should be collected and sent to some recognised systematist for identification.

Whatever may be the species of *Ganoderma*, however, the remedial measures to be taken would be similar, namely, the grubbing out and burning of attacked trees and, the isolation of diseased areas by deep trenches. As far as is practicable the production of wounds in the process of "cleaning" should be reduced to a minimum. Although it is unlikely that infection by these trunk-rotting fungi ever takes place through the crown, such wounds may offer entrance to other organisms. Obviously, also, felled trunks should not be left lying for any length of time, or a crop of sporephores would be produced from which now spore infections might take place.

II.—Bud-rot?

Hitherto the disease known as "Bud-rot" has only been known to attack the coconut palm. In a report dated November 22nd, 1917, on the occurrence of disease in coconut and oil palms in the Southern Provinces of Nigeria, Mr. C. O. Farquharson pointed out that should a specially virulent strain of the organism of bud-rot ever become evolved, capable of attacking the oil palm, the practice of cabbage-tapping provides an easy mode of entrance. Mr. Farquharson recommended that cabbage-tapping should be rigorously suppressed, and that all tapping for wine should be prohibited in districts where coconut bud-rot exists.

In view of this warning, it is disquieting to note that Mr. Swainson Hall has reported the existence of a disease of oil palms in the Portuguese Congo which suggests very strongly "Bud-rot." He states that the disease attacks the palms during the

period of fruit-bearing. Young bunches of fruits ripen prematurely, and eventually become dried up. The leaf-bases of the younger leaves are infected, and in the course of six to eight weeks the leaves wilt and fall over, finally breaking away. The disease eventually reaches the soft, succulent growing-point, which rots away, and emits an exceedingly foul odour. Attacked palms never recover.

No confirmatory evidence as to the nature of this disease has been obtained, but the symptoms, especially the evil-smelling rot of the growing-point, are certainly indicative of bud-rot whatever the cause of the disease may be. No such disease has as yet been reported from any other districts.

III.—Boring Beetles.

In connection with the possible spread of fungus diseases, in particular *Ganoderma lucidum* and other trunk-rotting species, by means of beetles, it is interesting to note that a beetle which was found by Mr. Swainson Hall to be doing considerable damage to oil palms has been identified by Dr. Guy Marshall as *Oryctes owariensis*, P. de B. Mr. Hall states that since the beginning of the year he has cut down and destroyed 40 trees attacked by this beetle, which attacks not only the trunks but also the top of the palm. It is probable that the adoption of measures to decrease the numbers of these beetles would also be of use in checking the spread of certain fungus diseases.

E. M. Wakefield—Kew Bull. No. 9—1920.

CROP RECORDS OF OIL PALMS.

WRITING in the "Communications of the General Experimental Station of the A. V. R. O. S." General Series No. 8. 1920, Dr. A. A. L. Rutgers contributes an account of the methods employed in Sumatra in the cultivation of the oil palm (*Elaeis guineensis*) with crop records of a number of palms under investigation in various districts in that country.

Introduction.

The area planted with oil palms on the east coast of Sumatra is increasing rapidly. Recent statistics are not available but it is estimated that at the commencement of 1920 about 15,000 acres were under cultivation, of which 5,000 acres were planted during the previous year. It is anticipated that the total area under this crop will be extended to 100,000 acres within the next ten years. When this area comes into bearing a yield of nearly 100,000 tons of oil per annum may be expected. The importance of this figure is shown by comparison with the total export from West Africa before the war, which has been calculated as 125,000 tons of palm oil and 325,000 tons of kernels.

Description of the Palms under Observation.

The crop records have been compiled from groups of palms on different estates, usually from ten to thirty palms from each group have been taken for observation. The fruit of these palms have been harvested separately by the staff of the Experimental Station once or twice a month. Each bunch collected has been weighed and the fruits extracted and weighed separately. From certain groups the weight of the fruits, stones and kernels have been recorded to obtain the percentage of pericarp and kernels. As a rule the small fruits without kernels, which in some cases form a considerable proportion of the bunch, have been neglected. The figures obtained are therefore conservative.

The records for three estates (Marihat, Piassa Oeloe and Tanah Itam Oeloe) have been collected by the estate managers without the assistance of the Experimental Station.

The palms under observation are situated as follows:

Ornamental Palms at St. Cyr.—Height above sea-level 282 feet. Some of the oldest palms on the east coast of Sumatra. These were planted during 1884, 1898, 1903 and 1911, on both sides of a road to the managers' bungalow. The palms are planted $14\frac{3}{4}$ feet and $16\frac{1}{2}$ feet in rows and are partly shaded by large Ficus trees. Observations have been made during 1918 only.

Mata Pao Estate.—Height above sea-level 33 feet. The records have been taken from two rows of 20 palms, planted in 1913, at a distance of 33 feet by 33 feet apart, with coffee as a catch-crop. The

palms Nos. 1 to 20 have been pruned as usual on the estate, the leaves being cut as soon as the fruits commence to grow. Palms numbering 21 to 40 have been pruned less severely.

Poeloe Radja Estate.—Height above sea-level 164 feet. The records have been collected from two rows of palms, planted in 1902, at a distance of $29\frac{1}{2}$ feet by $29\frac{1}{2}$ feet apart, formerly with coffee as a catch-crop. Palms Nos. 1 to 20 and 21 to 40 have been treated in the same way as on Mata Pao Estate.

Bekalla Estate.—Height above sea-level 203 feet. Palms Nos. 1 to 14, planted in 1898, may be considered as plantation palms, their conditions being as favourable as on a regular plantation. Palms Nos. 1 to 10 of the second series are counted as ornamental palms and were planted in 1888.

Marihat Baris Estate.—Height above sea-level 1,148 feet. Crop records are given from 139 ornamental palms planted $26\frac{1}{4}$ feet by $26\frac{1}{4}$ feet during 1914 on both sides of a road between coffee and rubber.

Piassa Oeloe Estate.—Height above sea-level 295 feet. Records are given for 1918 only from 281 plantation palms, planted $39\frac{1}{3}$ feet by $39\frac{1}{3}$ feet during 1912 and 1913.

Tanah Itam Oeloe Estate.—Height above sea-level 164 feet. Records were kept from 766 trees, planted $32\frac{3}{4}$ feet by $32\frac{3}{4}$ feet in January, 1915.

Cultivation.

Soils.—The oil palm is found bordering the West African coast from Senegal to the Congo, a region 2,485 miles long and 30 to 620 miles deep. It would appear that this vast area must contain soils of varying types. It is probable therefore that the oil palm is not restricted to special soils, its present distribution in Africa being not limited by soil conditions but by climatological factors. A rainfall of 40 inches appears to be the minimum. Little information is available regarding the types of land most suitable for the growth of *Elaeis* but the conclusions drawn by Chevalier and Hubert and confirmed by the experience obtained on the east coast of Sumatra are that the oil palm will grow in a variety of soils providing they are not swampy, and gives the best results on rich soil, not too heavy.

Height above Sea-level.—In Africa the oil palm is not restricted to the coast, but has been found at an altitude of 3,937 feet and even 4,757 feet. On the east coast of Sumatra, oil palms, at 1,148 feet above sea-level are yielding the same crops as those on the plains.

Planting Distances.—The majority of the oil palms in Sumatra have been planted 32.8 feet by 32.8 feet or 29.5 feet by 29.5 feet. The Author is of opinion that even 29.5 feet by 29.5 feet square is too wide. He advises 29.5 feet by 29.5 feet triangular or 26.2 feet by 26.2 feet square.

Diseases and Pests.—The oil palm is remarkably free from pests and diseases. The coconut-beetles have not been recorded as damaging the stems of the palms in Sumatra *. The larvæ of several species of insects (*Psychidae* and *Limacodidae*) have been observed feeding on the palms and will probably become more serious when larger areas have been planted.

Germination of the Seeds.—Oil palm seeds germinate very slowly, in some cases germination taking place in three months but more often taking nine months, while seeds imported from Africa as a rule do not germinate within twelve months.

The Agriculturist of the Experimental Station, Mr. Maas, commenced an extensive series of experiments to determine the factors influencing germination and the measures to be adopted to promote acceleration. A report on these experiments, which is not yet complete, will be published in due course. Some preliminary results are however available.

The experience gained at the Experimental Station and at Buitenzorg both demonstrate that fresh seeds germinate more rapidly than old seeds.

Several facts indicate that heat assists germination. Seeds immersed in hot water or fermented, germinate earlier than control seeds; this has been proved to be the case both at the Experimental Station and on estates in Sumatra and also in Africa. It appears that the seeds are able to stand a considerable temperature, as high as 50° centigrade being found unharmful. No success has been obtained by cracking or filing the nuts.

Pruning.—Pruning is commonly practised on the east coast of Sumatra. As a rule the lowest leaves are cut away near the stem as soon as the bunch of fruit resting on the leaf has been pollinated and the fruits commence to grow. Should this method be practised severely, it appears likely that the palm will suffer; its leaves being forced into development too early causing the stem to grow to a greater height than normally. The results published by Bücher and Fickendey show that the oil palms on the east coast of Sumatra form a tall stem more quickly than in Africa.

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* In this connection it is important to note that the Government Entomologist, F.M.S., considers the African oil palm as susceptible to the ravages of the red weevil, *Rhyncophorus ferrugineus*, as the coconut palm.

During May, 1920, an African oil palm on the Experimental Plantation at Kuala Lumpur fell for no apparent reason, and upon examination was found to contain grubs of the red weevil. An adjoining palm possessing an unhealthy appearance was felled and found to be similarly attacked. The Government Entomologist further reports that in December, 1920, while making an inspection of some palms on the Experimental Plantation, two red weevils were observed on a palm attempting to force their rostrums into cracks on the trunk. Keeping them under observation, two more weevils were seen and one of these resting on the cut surface of a petiole was noticed to force its snout into it, turn round and, after several unsuccessful attempts, lay an egg. It might be mentioned that although the leaves of this palm had been cut away a week previously, the fermenting sap still attracted the weevils and the cut surface was in a condition suitable for the deposition of eggs.

It is therefore evident that when stem pruning is found necessary, precautions must be taken to prevent the weevils from laying their eggs through the cut surfaces.

To obtain information on the influence of pruning on production, the Experimental Station commenced two experiments. On Mata Pao Estate three plots of thirty palms and on Poeloe Radja Estate two rows of twenty palms were pruned in different ways and the fruits of these palms harvested separately. As the crop records cover only a period of six months it is not yet possible to draw conclusions. The results, however, so far obtained are contradictory as on Mata Pao Estate the highest production is obtained from the severely pruned palms while on Poeloe Radja Estate the heaviest yield is recorded from palms pruned less than usual. The following tables give the figures obtained:

PRODUCTION FROM PRUNED OIL PALMS FROM MATA PAO ESTATE OVER A PERIOD OF SIX MONTHS, IN LBS.

Month	Group II. Pruned less than usual No. 21-40, 51-60		Group I. Pruned as usual No. 1-20, 41-50		Group III. Severely pruned No. 61-90	
	Bunches	Fruits	Bunches	Fruits	Bunches	Fruits
October, 1919	253.3	86.7	166.9	49.2	139.6	67.1
November	118.4	38.4	82.9	13.2	50.5	5.9
December	143.8	56.4	43.9	8.9	205.9	107.4
January, 1920	37.7	17.8	119.5	66.9	133.2	59.7
February	74.5	22.4	155.0	78.3	83.6	25.2
March	267.7	124.6	378.1	157.3	346.1	142.7
Total ...	895.4	346.3	946.3	373.8	958.9	408.0
Percentage ...	100	100	106	108	107	118

PRODUCTION FROM PRUNED OIL PALMS FROM POELOE RADJA ESTATE OVER A PERIOD OF SIX MONTHS, IN LBS.

Month	Group I. Pruned as usual No. 1-20		Group II. Pruned less than usual No. 21-40	
	Bunches	Fruits	Bunches	Fruits
October, 1919	325.8	72.5	231.6	45.4
November	548.4	143.5	440.4	153.3
December	465.2	110.7	469.2	119.1
January, 1920...	326.4	106.3	524.6	185.9
February	474.5	175.9	581.7	237.8
March	496.1	147.2	392.9	151.0
Total ...	2,636.4	756.1	2,640.4	892.5
Percentage ...	100	85	100	100

The general opinion is that the largest bunches are obtained by removing the leaves as soon as the fruits commence to grow; this conclusion has so far not been contradicted by experiment.

Pollination.—It is obvious that the natural pollination of oil palms is far from satisfactory and is indicated by the low percentage of fruits on the bunches. When pollination has been effective, the fruits form 50 per cent. or more of the weight of the bunch whereas where poor pollination has taken place the percentage may drop to 25 per cent. or even lower.

Probably, one of the factors determining the crop is the fertility of the soil, but pollination is certainly another important factor and this is confirmed by the results obtained by Mr. Schadt on Tanah Itam Oeloe Estate. As pollination is easily done by hand it appears probable that artificial pollination will become a regular undertaking in estate practice. Certain observations tend to show that there is a relationship between the number of insects visiting the oil palms during flowering and the number of fruits that mature.

Distribution of the Crop over the year.—Usually, the production of fruit is lowest during the first and last months of the year. On Mata Pao Estate this is definitely the case, the best four months being May to August, giving a yield of 201 bunches against a minimum of 60 bunches during the four months, November to February. On Tanah Itam Oeloe Estate, a yield of 188 bunches against 79 is recorded, while on Poeloe Radja the proportion is 118 bunches to 51. On Bekalla, St. Cyr and Marihat Estates the distribution is even throughout the year. It is a well known fact that dry weather is unfavourable to the production of fruit; and in the dry regions of Africa the factories close down for several months of the year. It therefore appears probable that rainfall has much to do with the variability of production during the year. The following figures obtained during 1919 show the distribution of the crop over the year on a number of estates but do not as yet lead to conclusive results.

DISTRIBUTION OF THE CROP OVER THE YEAR. NUMBER OF BUNCHES PER MONTH.

Month.	Mata Pao.*		Poeloe Radja.		Bekalla.		St. Cyr.	
	1918.	1919.	1918.	1919.	1918.	1919.	1918.	1919.
January	6	13	...	5	...	14	17	...
February	5	22	...	10	...	15	13	...
March	9	18	...	9	...	18	7	...
April	30	37	...	27	...	23	6	...
May	36	58	...	21	...	23	10	...
June	40	40	...	23	...	22	13	...
July	34	51	...	34	...	12	7	...
August	26	52	22	32	20	11	21	...
September ...	24	38	28	29	22	11	14	...
October	17	20	28	14	19	15	17	...
November... ...	9	20	11	22	11	18	23	...
December	7	5	9	27	17	13	16	...

* Mata Pao Estate in 1918 from 20 palms, in 1919 from 40 palms.

DISTRIBUTION OF THE CROP OVER THE YEAR. NUMBER OF BUNCHES PER MONTH—(*cont.*)

Month.	Marihat.		Piassa Oeloe.		Tanah Itam Oeloe.*	
	1918.	1919.	1918.	1919.	1918.	1919.
January	150	88	...	331	3	9
February	130	93	...	326	7	11
March	157	100	...	419	8	32
April	171	92	...	...	8	31
May	169	107	...	...	18	18
June	174	121	...	...	17	59
July	204	152	...	...	11	48
August	138	87	...	...	15	27
September	49	100	...	...	15	54
October	135	118	279	...	15	41
November	124	91	432	...	13	27
December	120	108	361	...	16	32

Age at which Palms come into Bearing.—Available facts have been too scanty to allow of definite conclusions being given in previous publications. The figures from Tanah Itam Oeloe Estate, given in this paper, show that in certain cases, a crop may be expected in the fourth year. A block of 16.9 acres, on that estate, produced in the fourth year, 41.89 lbs. of fruit per palm and in the fifth year 112.45 lbs. Certain palms at the Experimental Station came into bearing when only two years old.

CROP RECORDS 1918 AND 1919.

The basis for calculating the yields of the palms under investigation is the production per palm per annum. Therefore, three series of figures have been recorded :

(*a*) Production of bunches and fruit.

(*b*) Percentage of pericarp, nuts and kernels in the fruit.

(*c*) Percentage of oil in the pericarp and the kernels.

The first two points have been investigated by the author and the third by Ir. van Heurn, who published his results in 1919.[1] A compilation of the results obtained in 1918 and 1919 as to the production of bunches and fruit by the palms under observation is given in Table I. These figures compare favourably with those recorded from Africa. Averaging the figures of Adam, Chevalier and Hubert, the following figures are obtained ; number of bunches 6.4, weight per bunch 13.23 lbs., total weight of bunches 84.67 lbs., total weight fruits 59.53 lbs.

* Tanah Itam Oeloe Estate weight of fruit in 100 kilograms.

[1] Ir. Jhr. van Heurn. Vetbepalingen bij oliepalmvruchten. Mededeelingen van het Algemeen Proefstation der A.V.R.O.S. Algemeene Serie No. 6, 1919 Published in Dutch only.

TABLE I.

CROP PER PALM PER ANNUM IN LBS.

Estate.	Planted.	Year.	Number of bunches.	Weight per bunch.	Total weight, bunches.	Total weight, fruits.
Mata Pao	1913	1918	12.1	6.61	79.38	30.87
		1919	9.2	10.80	101.43	39.69
,, ...	1913	1918	...	...	...	...
		1919	9.5	12.12	114.66	50.71[1]
Poeloe Radja ...	1912	1918	11.3	14.11	158.76	50.71
		1919	14.5	14.77	213.88	46.30[2]
,, ,, ...	1912	1918	...	...	...	...
		1919	12.6	16.53	297.27	52.92[1]
Bekalla	1898	1918	11.0	34.17	357.21	145.53
		1919	9.6	35.72	341.77	123.48
Ornamental palms Bekalla	1888	1918	5.2	29.54	154.35	70.56
		1919	6.0	30.20	180.81	70.56
,, St. Cyr H	1911	1918	2.4	9.92	24.25	11.02
		1919	...	...	...	...
,, ,, E	1903	1918	6.8	41.01	280.03	136.71
		1919	...	...	...	...
,, ,, B	1898	1918	4.9	56.44	275.62	149.94
		1919	...	...	...	...
,, ,, A	1884	1918	2.5	47.84	121.27	66.15
		1919	...	...	...	...
,, Maribat	1913	1918	12.4	12.34	154.35	92.61
Baris		1919	9.0	15.65	141.12	99.22
Piassa Oeloe ...	1912	1918	15.3	14.99	233.73	116.86
		1919	...	...	...	...
Tanah Itam Oeloe...	1914	1918	...	...	...	41.89
		1919	...	...	...	112.45

The figures in Table I show considerable variation and it is therefore a matter of some difficulty to estimate an average crop. In Table II, the estimate published in 1919 is reproduced but in all probability it may be considered too low for the young palms and perhaps too high for those in full bearing.

TABLE II.

ESTIMATED AVERAGE CROP PER PALM IN LBS.

	Number of bunches.	Weight per bunch.	Total weight, bunches.	Total weight, fruits.
5th-10th year ...	12	13	158	53
11th-30th year ...	10	33	330	165
31st-50th year ...	3	44	132	66

[1] These palms have been pruned less than usual.

[2] The percentage of fruits in the bunches is very low on Poeloe Radja Estate Probably, pollination is deficient.

The second point under investigation is the percentage of fruits, pericarp, nuts and kernels in the bunches. The weight of the fruits has been taken as a basis for calculating the percentage. In Table III, which gives the results for 1918 and 1919, the weight of the fruit is therefore placed at 100 and shows that the fruits contain 60 per cent. pericarp and 8 per cent. kernels.

TABLE III.

WEIGHT OF BUNCHES, PERICARP, NUTS AND KERNELS, IN PER CENT. OF THE FRUITS.

Estate.	Planted.	Year.	Bunches.	Fruits.	Pericarp, per cent.	Nuts, per cent.	Kernels, per cent.
Mata Pao	1913	1918	270	100	60	40	7
		1919	250	100	56	44	9
„	„	1918	...	...	...	...	...
		1919	240	100	61	39	8
Poeloe Radja	1912	1918	310	100	63	37	7
		1919	450	100	...	...	...
„	„	1918	...	...	...	...	...
		1919	390	100	...	...	...
Bekalla	1898	1918	255	100	65	35	8
		1919	280	100	62	38	8
„ ornamental palms	1888	1918	215	100	62	38	9
		1919	210	100	55	45	12
St. Cyr H. „	1911	1918	200	100	64	36	8
		1919	...	...	...	...	...
„ E. „	1903	1918	220	100	65	35	7
		1919	...	...	...	...	...
„ B. „	1898	1918	200	100	55	45	11
		1919	...	...	...	...	...
„ A. „	1884	1918	280	100	63	37	8
		1919	...	...	...	...	...
Marihat Baris „	1913	1918	165	100	50	50	...
		1919	141	100	50	50	...
Piassa Oeloe	1912	1918	195	100	61	39	...
		1919	...	...	...	...	...
Tanah Itam Oeloe ...	1914	1918	...	100	61	39	...
		1919	...	100	61	39	...

BASIS FOR CALCULATING PROBABLE YIELDS.

In Table IV an estimate is given of the yields that may be expected from this crop from the 5th to the 50th year. The figures must be considered as theoretical as calculated yields should always be accepted with some caution. Further the figures show the total amount of fat present and even the best machinery can only expect to extract 80 per cent. of palm oil and 100 per cent. of the kernels. It is therefore probable that these figures are somewhat high but against this the normal fruits only have been weighed at the

Experimental Station and the smaller fruits without kernels thrown away. The latter contain a considerable amount of fat which might be readily extracted by efficient machinery.

The estimated yields of fruits and oil from an acre of oil palms planted 26 feet by 26 feet—*i.e.*, at sixty-four palms to the acre, work out as follows.

ESTIMATED YIELDS.

PRODUCTION PER ACRE PER YEAR IN TONS PLANTED 26 BY 26 FT.

	Number of bunches.	Weight of bunches.	Weight of fruits.	Weight of pericarp.	Weight of palm oil.	Weight of kernels.
5th-10th year ...	768	4.51	1.51	0.906	0.498	0.121
11th-30th year ...	640	9.44	4.72	2.826	1.554	0.377
31st-50th year ...	192	3.77	1.89	1.134	0.624	0.151

J. N. M.

SHORT REPORT ON THE WORK OF THE INSPECTION STAFF, SECOND HALF-YEAR, 1920.

THE European staff has been augmented by the appointment of Mr. A. E. C. Doscas to the Federated Malay States Service and of Mr. J. Fairweather to the Straits Settlements Service, as well as by the return from leave of Mr. T. C. Nock. Mr. Doscas reported his arrival on July 23rd and took up his duties as Assistant Agricultural Inspector, Negri Sembilan and Pahang, and Acting Assistant Agricultural Inspector, Malacca, on October 1st after an interval spent in becoming acquainted with the country and his work. Mr. Fairweather and Mr. Nock arrived on December 15th. Mr. Fairweather will probably take up his duties in Malacca at the end of March and Mr. Nock proceeds to Kuala Lipis to act as Assistant Agricultural Inspector, Pahang North, at the beginning of next year.

Inche Mohamed Noor bin Hamzah has been transferred from Taiping to be Junior Agricultural Assistant in Province Wellesley and Penang.

The staff of Malay Probationers for the Straits Settlements and Federated Malay States has been completed. A Probationer has also been appointed by the Kedah Government and is undergoing training along with the other new officers.

The second Senior Course of lectures to Malay Probationers commenced in May, was concluded at the end of September and was followed by the usual examination. A third Junior Course was commenced on November 11th and is still in progress. Transfers of staff were made to enable those officers attending the lectures to work at the head office.

Visits were paid by inspecting officers to 15 estates in Perak, 3 in Selangor, 12 in Negri Sembilan, 3 in Malacca and 2 in Johore, making a total of 35 visits. In all there have been 81 estates visited during the year. It is hoped that next year with the increased European staff many more estates may be visited.

During the dry weather in the third quarter of the year mouldy rot disease on rubber (*Sphaeronema fimbriatum* E. and H.) became much less prevalent and even disappeared entirely from some of the infected areas. The last quarter, however, was very wet and in consequence the disease rapidly developed again, even in holdings from which it had completely disappeared.

In Negri Sembilan the renewed outbreak was kept under fairly satisfactory control in the older infected area, but made its appearance for the first time in the Coast district, the Labu Valley and at Jelebu where it is receiving careful attention. In Johore its control has been less satisfactory, partly, owing to the extreme apathy of the local small holders, in spite of the efforts of inspecting officers to arouse them to action.

A dying back of the edge of the tapping cut was observed on one estate in Selangor, on another in Malacca and on a small holding in Grisek mukim, Muar district, Johore. This dying back if untreated extends downwards into the bark below and forms

irregularly shaped diseased patches, sometimes of considerable extent, which resemble patch canker. This disease is being investigated; it is similar to a disease reported from Ceylon.

A decay of the renewing bark about 2 inches above the tapping cut was reported during the dry weather from one estate in Selangor, 2 in Negri Sembilan and 2 in Malacca. The decay is accompanied by the growth of a light mould on the dead bark and for this reason and on account of its general appearance the disease is at times confused with mouldy rot. It is, however, quite different and seems to be largely dependant on dry weather for its appearance. It generally occurs more frequently on trees that have been closely tapped and at spots where the cortex left is thin. It should receive attention when circumstances permit and should be easy to control by means of the usual disinfectants.

Stumps of betel nut palms (*Areca catechu*) felled to make room for young rubber trees, were found to be attacked by *Ustulina zonata* and to be covered over the base, where they were surrounded with grass and fern, with large fructifications of the fungus. These stumps were on small holdings in Pagoh mukim, Muar district, Johore. This is a new host for *Ustulina zonata*, at any rate in this country.

During the half year, both the black beetle (*Oryctes rhinocerus*) and the red weevil (*Rhyncophorus ferrugineus*) were very numerous in different parts of the Peninsula, more especially in Krian, in Klang district, around Seremban, in Province Wellesley and in Malacca, while they were also somewhat conspicuous at Muar in Johore. The usual routine control measures were strongly enforced. Field observations were made in co-operation with the Government Entomologist and material was sent to the head office to assist him in his investigations on the life history and more effective control of these insects. Special work was done in Malacca which included lectures on the habits of coconut beetles to the head men in various mukims.

Minor pests of coconuts included skipper and nettle caterpillars (*Hidari irava and Thosea* sp.) in Pahang and Johore.

Various pests of padi were reported during the half year Army worms (*Spodoptera mauritia*) appeared in August on certain padi nurseries in Malacca, but were controlled easily, partly by hand picking and partly by their natural enemies, especially a Tachinid fly.

In Perak, during October and November, experiments were conducted on the control of "Bena Kura" (*Podops coarctata*) a medium sized brown bug, stem borers (*Schœnobius bipunctifer* and other species), and the mole cricket (*Gryllotalpa* sp.) Spraying with kerosene emulsion and extract of tuba root (*Derris* sp.) were tried with uncertain results and lamp traps were also employed, with some success in the case of stem borers and mole crickets. Rats as usual did damage to the padi in some parts.

The padi in Negri Sembilan was planted fairly early and damaged by the drought in August and September which also caused some damage in parts of Perak. The area planted and the appearance of the padi generally in Province Wellesley, Penang, Malacca and Krian are quite satisfactory. These crops were planted later, were less affected by the drought, and should yield well.

In the earlier part of the year some progress was made with the work of enforcing the removal of bush and lalang from agricultural land and the carrying out of proper sanitation measures on small rubber holdings, such as the burning of large dead branches or trunks of rubber and the removal and burning of rubber stumps. Owing to the fall in the price of rubber, tapping has been discontinued on many of these holdings and the owners have relied on other sources of income or have sought work elsewhere. Consequently holdings are liable to become overgrown with weeds and the Department has had to relax its efforts to improve these conditions, as the enforcement of its orders was liable to entail undue hardship on the owner.

Water hyacinth has now been brought under control on State land and in rivers in Krian district and can be kept under control by the regular employment of a small gang of coolies to patrol the rivers and visit State land periodically. The Perak river is being cleaned for a second time below Kuala Kangsar. In Province Wellesley and Malacca steps are being taken to ascertain the extent of land on which this pest is found and to form an idea of the damage it is actually doing or may be expected to do if left to spread

A successful conference of Malay officers of the department was held in August, at which these officers read papers on agricultural subjects and held discussions in Malay. The papers are being published in the *Malay Agricultural Bulletin.*

General work done by inspecting officers has included a lecture by the Chief Agricultural Inspector to the Lower Perak District Planters' Association at Telok Anson on August 23rd, the subject being "Diseases of the Coconut Palm"; this lecture was well attended. In addition, the Assistant Agricultural Inspector, Perak, assisted the Acting Economic Botanist to plant the experimental padi plots of the department in Krian during November while the Assistant Agricultural Inspector, Negri Sembilan, acted as judge at three agricultural shows in the State during November and December. He considered the quality of the exhibits good, but thought that their display left room for improvement.

The fall in the price of rubber during the half year has resulted in the closing down of many holdings of from 1 to 50 acres in extent owned by Asiatics. Chinese miners and shopkeepers have in many cases been unable to pay coolies to continue tapping on holdings of over 10 acres in extent, while owners of smaller holdings tapped by themselves have been unable to make a living out of their rubber and have either grown their own padi on sought employment outside. The number of such holdings in some parts is very high and probably amounts to quite 50 per cent. of the holdings. The price obtained for native grown rubber has varied from 10 to 20 cents per kati so that clearly a holding yielding not more than 3 katies a day will not support the owner and his family. Where tapping is continued on such holdings, either the owner has some additional means of support or his land is in a locality where no other employment is available and he must obtain what he can from his land to help him to live. The fine fruit harvest at the end of the year helped some of these small holders to augment their insufficient incomes.

F. W. S.

MINUTES OF ORDINARY MEETING OF THE PLANTERS' ASSOCIATION OF MALAYA,

held at Sungkai Club, Sungkai, on
12th January, 1921, at 11.30 a.m.

PRESENT:

Mr. T. J. Cumming (in the Chair)

„ C. Ward-Jackson (*Secretary*)

DELEGATES:

From the	Bahau-Kuala Pilah D.P.A.	Mr. C. W. Keppel-Powis
„	Batang Padang D.P.A. ...	Messrs. C. B. Graburn, H. Gordon Graham and C. Darby
„	Central Perak P.A. ...	Major G. Nevill Stevens, Messrs. E. L. D. Evans and G. E. Johnson
„	Johore P.A.	Mr. C. Bradbery
„	Kajang D.P.A.	Messrs. C. R. Ferrers and A. C. Hayton
„	Klang D.P.A.	„ W. S. Reeve-Tucker, C. Hammond-Smith and A. Douglas
„	Kuala Lumpur D.P.A. ...	„ H. Armstrong, R. G. Ladell and V. Utterson Kelso
„	Kuala Selangor D.P.A. ...	Major A. B. Sleo
„	Lower Perak P.A. ...	Messrs. W. R. C. Gray, J. W. Cruickshank, R. M. Latham, and W. H. Vaughan-Smith
„	Negri Sembilan P.A. ...	Mr. C. H. Swinton
„	Ulu Selangor D.P.A. ...	„ M. J. Kennaway and Major C. H. Huxtable, D.S.O., M.C.

VISITORS.—Messrs. L. Faulkener-Willis, J. M. P. Landon, J. Whyte, T. H. Stewart, B. H. Lewis, Wm. Whitforde, P. M. Philson, E. P. Lorange, F. H. Mustard, M. Keating, E. J. Perkins, A. L. Hellinson, J. St. John Smith, T. G. Laver, J. A. Fox, E. A. Wilson, R. Davison, J. Marshall, J. W. Williamson, Fred. Knocker, G. Ross Smith and Donald V. Byles.

PRELIMINARY.

Mr. GRABURN announces with regret that the Vice and Acting Chairman, Mr. J. Bruce, is unfortunately unable to attend to-day through ill-health. He states that the Standing Committee had invited the Hon. Mr. William Duncan to deputise for Mr. Bruce. Mr. Duncan, however, is at present in Singapore attending a highly important meeting relating to the Duncan Committee's Crop Restriction proposals. He says Mr. Bruce has nominated Mr. T. J. Cumming to be Chairman of this meeting and he asks the meeting to confirm Mr. Bruce's nomination. He has pleasure in calling upon Mr. Cumming to occupy the Chair.

Mr. CUMMING in taking the Chair thanks the meeting for confirming Mr. Bruce's nomination and says he very much regrets Mr. Bruce's illness from which he trusts he will soon recover. He thinks it extremely unfortunate that in a crisis like the present the Association's Chairman should be away in England and that their Vice-Chairman, through no fault of his own, is absent. He realizes it is extremely difficult to conduct a meeting like this unless the threads of the various subjects about to be discussed are to hand; but with the assistance of the delegates he hopes to conduct the meeting to the best of his ability. He asks the delegates to be concise in their remarks and to speak to the point.

1.—MINUTES.

On the proposal of Mr. Gray, seconded by Mr. Armstrong, the minutes of the Ordinary Meeting held on 27th September, 1920, are confirmed.

2.—WAR RELIEF.

The SECRETARY submits the following:

FEDERATED MALAY STATES WAR RELIEF FUND, SCHEME No. 2. STATEMENT OF ACCOUNT, 1ST JULY TO 30TH SEPTEMBER, 1920.

Receipts.	Amount. £ s. d.
Balance brought forward from last account	38,274 8 4
Interest on Investments	87 10 0
	38,361 18 4

Payments.	£ s. d.	Amount. £ s. d.
Grants and gratuities:		
Mrs. ——	20 0 0	
,, ——	25 0 0	
,, ——	40 0 0	
,, ——	40 0 0	
,, ——	40 0 0	
,, ——	40 0 0	
,, ——	17 0 0	
,, ——	20 0 0	
,, ——	20 0 0	
,, ——	50 0 0	
,, ——	20 0 0	
,, ——	40 0 0	
Mr. ——	1,000 0 0	
Mrs. ——	40 0 0	
,, ——	40 0 0	
Dr. —— f. Mr.	8 12 6	
Mr. ——	50 0 0	
		1,510 12 6
Bank charges		0 8 4
Postage, telegrams and sundries		1 2 4
Balance carried forward		36,849 15 2
		38,361 18 4

The balance of £36,849 15s. 2d. is disposed of as follows:

	£ s. d.	£ s. d.
Five per cent. War Loan (£12,000) at cost		11,400 0 0
Four per cent. Funding Loan (£2,500) at cost		2,000 0 0
National War Bonds (£21,000)		21,000 0 0
On deposit with Chartered Bank of India, etc.		2,000 0 0
Balance of current account in Chartered Bank	453 15 2	
Less cheques outstanding	4 0 0	
		449 15 2
		36,849 15 2

(Sd.) W. T. TAYLOR,
8th October, 1920.

I hereby certify that I have audited the above statement of receipts and payments with the books and vouchers of the Fund and find the same to be correct. The grants have all been duly authorized by the Committee.

73, BASINGHALL STREET, E.C.,
11th October, 1920.

(Sd.) A. H. CULLEN,
Chartered Accountant,
Honorary Auditor.

3.—LABOUR MATTERS.

The SECRETARY submits the following:

At a meeting of the Standing Committee of the Planters' Association of Malaya, which was held on 22nd December, 1920, questions relating to the wages of estate labourers were discussed and the Committee decided to inform the Executive of the General Labour Committee that they intended to recommend to Constituent Associations that, owing to the conditions existing upon rubber estates in Malaya, the operation of certain of the Labour Committee's recommendations, *e.g.*, as to wages, bonus, etc., should be postponed until conditions became more or less normal.

The Executive of the General Labour Committee met on the 29th and the following resolution was passed unanimously:

"That the Executive of the General Labour Committee consider that the recommendations made in their Report on Indian Labour and Labourers bearing date 11th August, 1920, were both sound and necessary when they were made; but in view of the materially changed conditions obtaining upon rubber estates in Malaya at the present time the Executive Committee recommend that each Planting Association in Malaya shall consider the advisability of suspending temporarily the operation of the Labour Committee's recommendations and of their taking such action as they consider will meet the existing circumstances."

"OFFICE OF THE CONTROLLER OF LABOUR,
"S.S AND F.M.S.,
"KUALA LUMPUR,
"*5th December, 1920.*

"No. 2 in 726/20.

"SIR,

"I have the honour to inform you that attention has been drawn to the frequent existence of ankylostomiasis among pregnant women, and to the necessity for special care and treatment of such cases, many of which are reported to end fatally.

"2. I attach a few directions, drawn up by the Principal Medical Officer, as to what should be done in such cases, and I would ask that they be circulated among the members of your Association for their guidance.

"I have, etc.,
"(Sd.) W. PEEL,
"*Acting Controller of Labour, F.M.S.*

"THE SECRETARY,
"THE PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

"DIRECTIONS.

"1. Pregnant women should after six months be placed in a light labour gang.

"2. Blood and stools should be examined.

"3. The estate Medical Officer should examine the urine once a week for signs of kidney breakdown.

"4. The Health Officers should insist on this and order special diets if necessary.

"5. Women with 60 per cent. anæmia and pregnancy should go to hospital.

"6. There should be no dosing pregnant women with any drug in the lines. Chinopodium oil is a dangerous drug and should only be given with great care. It is a cause of abortion and miscarriage."

"OFFICE OF PRINCIPAL MEDICAL OFFICER, F.M.S.,
"KUALA LUMPUR,
"FEDERATED MALAY STATES,
"*8th January, 1921.*

"SIR,

"I have the honour to acknowledge the receipt of the notice of a meeting of the Planters' Association of Malaya to be held on 12th January at the Sungkai Club, for which I thank you.

"2. I see my views on the treatment of pregnant women on estates are mentioned.

"3. I may say that the death-rate amongst women from estates who require operative treatment for labour is far too high. This is due to malaria and ankylostomiasis causing acute anæmia during pregnancy and causing failure of the uterus (womb) to act during labour necessitating operative measures. The women often die of shock without any hæmorrhage at all. Others die of unrecognized and untreated kidney trouble. In placing the degree of anæmia needing hospital treatment at 60 per cent. I have put it far too low, 75 per cent. would have been far nearer the correct figure.

"Talliquist Hæmoglobinometer by which a drop of blood is dried upon blotting paper and when dry compared with a colour scale enables anyone to judge the degree of anæmia with a 5 per cent. error. The apparatus costs little or nothing.

"I trust this very important subject will have the attention of the members of the Planters' Association of Malaya.

"I have, etc.,
"(Sd.) R. DOWDEN,
"*Acting Principal Medical Officer, F.M.S.*

"C. WARD JACKSON, ESQ.,
"12, MARKET STREET,
"KUALA LUMPUR."

"Office of the Controller of Labour,
"S.S and F.M.S.,
"Kuala Lumpur,
"*1st December, 1920.*

"No. 709/20.

"Sir,

"I have the honour to forward for your information copy of a letter dated the 13th instant, from the Meenatchi Trading Company of Madras, and to ask that you will be so good as to give publicity to this among the planting community, if you consider it desirable to do so.

"I have, etc.,
"(Sd.) W. Peel,
"*Acting Controller of Labour, F.M.S.*"

"The Secretary,
"The Planters' Association of Malaya,
"Kuala Lumpur."

"The Meenatchi Trading Co.,
"Importers, Exporters and Agents.
"Telegrams: "WELCOME," Madras.
"Branches:
"Cocanada & Nagapatam,

"3, Kondi Chetty Street, Madras,
"*13th November, 1920.*

"Dear Sir,

"We are suppliers of provisions such as rice, ragi, turmeric, tamarind, pepper, mustard, coriander, chillies, onions and other produces and also piece goods such as dhoties, saree cloths for coolies. We are prepared to quote our price for your requirements. We request you to kindly register our name and send us all your enquiries.

"Please note we have been supplying poonac (groundnut and castor, etc.) to various estates for manuring purposes and shall be obliged if you will kindly ascertain from your estates and let us know their requirements when we will quote you.

"In the event of business resulting we shall be pleased if you will open a letter of credit in any of the local Banks at Madras where we will draw on demand for the value of goods shipped against documents or you may make arrangements with your local agents at Madras if any to pay for us against shipping documents.

"Yours faithfully,
"(Sd.) Meenatchi Trading Co.

"The Chairman,
"Indian Emigration Committee,
"Penang."

Mr. KENNAWAY desires to be informed whether Government is going to reduce the wages of labourers employed by its departments.

Mr. CUMMING believes that Mr. Duncan in his letter to the Secretary has something to say upon this subject.

The SECRETARY reads the following excerpt from a letter written by the Hon. Mr. W. Duncan dated 6th January.

"There is, I believe, an almost unanimous feeling amongst planters that the very abnormal conditions prevailing at least justify, if they do not demand, employers asking labour to accept considerably reduced rates of wages. Rice is likely to be reduced in price on 10th January from $1 to 80 cents and a further reduction to 65 cents on 1st February is anticipated. These reductions will help the general position and should accelerate the downward tendency of the cost of living which has, I believe, now begun. I feel that labourers will readily realize the gravity of the situation and will accept reduced wages as an alternative to unemployment. The reduction in wages will enable employers to retain a larger number of labourers on a given expenditure and thus further help the general situation. The extent of the reduction will no doubt be discussed and decided at the meeting and it would be well if unanimity should be achieved."

Mr. GRAY says the question of reducing rates of labourers' wages was discussed recently by the Lower Perak Planters' Association and it was decided that rates should be reduced to 40 cents for men and 30 cents for women labourers, as against the 50 and 40 cents, respectively, recommended by the General Labour Committee. He says the question was also discussed at the last meeting of the Standing Committee of the Planters' Association of Malaya when that Committee expressed itself as being in favour of reduction in wages. He is sure all employers should aim at retaining as much labour as they possibly could. In order to enable employers to do this it seems necessary to reduce the wages of labourers. He thinks the majority of labourers will be prepared to accept lower terms than those at present ruling or merely a living wage and retain their employment rather than submit to be discharged. He wishes to propose that this meeting is of opinion that wages should be reduced in view of the present position of rubber and that the different districts decide their own terms as to the number of days labourers should work and the rate of pay they should be given. He thinks the figures 40 and 30 cents might be included in his proposal as a basis and as a maximum.

Major SLEE states that planters in Kuala Selangor have reverted to pre-war rates of pay, which rates were lower than in districts like Lower Perak. The maximum for male adults is 33 cents; but only the best coolies are paid this amount. He says there has been no difficulty in getting coolies to accept this because they knew the alternative would be dismissal. He agrees

with Mr. Gray but begs to suggest that it would be better if the motion is worded that wages be reduced to pre-war rates and that the details be left to District Planters' Associations.

Mr. GRAY agrees to altering the wording as suggested by Major Slee.

Mr. GRABURN is of opinion that the meeting should first decide that the operation of certain of the recommendations of the General Labour Committee, whose Report was adopted by the Planters' Association of Malaya at Johore Bahru in September last, should be postponed until conditions become more or less normal.

Major SLEE seconds Mr. Graburn's proposal which is carried unanimously.

Major STEVENS states that the Central Perak Planters' Association have already agreed to the suspension of the Labour Committee's recommendations for the time being.

Mr. CUMMING refers to Mr. Gray's proposal and expresses the view that it is the duty of every estate and every manager to retain their labour to the last possible minute. He is convinced that the crisis through which the rubber industry is passing is only temporary and that the time will come when there will be a great need of and search for labour. He thinks therefore that every endeavour should be made to keep labour even if it is necessary to reduce wages. He takes the view that maximum or minimum rates should be left to the different districts while in districts it should be left to individual managers. He points out that circumstances and conditions vary in each district; that some managers have more power than others and that each manager should work according to his own requirements and circumstances. He thinks it would be a great advantage if Government would follow planters with regard to wages.

Mr. GRAY reiterates his motion that wages be reduced to the pre-war standard and details be left to District Planters' Associations.

Major SLEE seconds.

Major HUXTABLE thinks it might be unsatisfactory if the matter of wages were left to districts. He states that he himself has been compelled to cease working his coolies seven days in each month and if he is to reduce wages still more his coolies would lose. He thinks that a rate should be fixed at so much *per mensem* and not so much *per diem*.

Major SLEE thinks it necessary to take a broad view of the matter. If during a month a labourer is given work only upon 20 days it would follow that he would have to be paid more than he would if he were able to work 25 days a month. He is strongly in favour of wages being brought to the pre-war standard which should be a definite guide to employers in different districts and would help directors at home.

Mr. GRAY thinks that all these points are covered by his proposal that details of rates of pay and number of working days should be left to District Planters' Associations.

Mr. CUMMING invites a definite suggestion as to what the reduction should be.

Mr. ARMSTRONG points out that if Mr. Gray's resolution is passed District Planters' Associations would more or less be bound to agree to wages being reduced to the pre-war standard excepting as to details.

Mr. KELSO is strongly of opinion that wages should now be brought down to as low a figure as possible. He is convinced that whatever other companies might be doing local companies are working at a loss. He does not think that coolies should expect even what they were getting before the war. He would strongly urge that wages be reduced as low as possible just consistent with the cost of living.

Mr. CUMMING observes that the standard of living among labourers has not fallen to the pre-war standard and if the rates of pay were brought lower than the figures which prevailed before the war it might be extremely hard on the cooly.

Mr. KELSO is convinced that the cost of living will not fall appreciably until wages are considerably reduced.

Mr. ARMSTRONG proposes an amendment that this Association is in favour of the reduction of wages but it does not think that a definite flat rate should be stated.

Major SLEE points out that a definite flat rate has not been stated.

Mr. ARMSTRONG replies that the pre-war rate was stated. He therefore alters his amendment to read that this Association is in favour of reducing wages but that pre-war rates should not be stipulated.

Major HUXTABLE seconds.

The amendment is put to the meeting and is declared carried.

Mr. CUMMING states that at a meeting of the Executive of the General Labour Committee held on 29th December last, the following resolution was unanimously carried:

"That employers of Chinese labourers should take steps substantially to reduce the daily earnings of the Chinese labourers employed by them."

Mr. SWINTON states that the Negri Sembilan Planters' Association suggest that 70 cents should be the maximum daily wage for any Chinese labourers.

Mr. HAYTON states that the Kajang District Planters' Association has already reduced wages of Chinese to 70 cents.

Mr. KEPPEL-POWIS says the whole of Kuala Pilah district had reduced wages to the same figure.

Major STEVENS thinks that the maximum rate of wages to Chinese should, as in the case of Tamils, be left to districts and managers.

Mr. REEVE-TUCKER enquires upon what amount it is possible for a Chinese labourer to live *per mensem*.

Mr. HAYTON has made enquiries and believes that the average Chinese labourer can live upon $15 *per mensem*.

The SECRETARY states that at a recent meeting of the Executive of the General Labour Committee Mr. Choo Kia Peng expressed the view that a Chinese cooly could live upon the amount stated by Mr. Hayton.

Mr. CUMMING says it is evident that all employers are alive to the desirability of reducing wages and he thinks perhaps the matter might be left to employers as suggested by Major Stevens.

Mr. REEVE-TUCKER suggests that the Federated Malay States Chamber of Mines be written to with a view of ascertaining the daily wages which miners pay to their labourers. It occurs to him that while planters might reduce wages to 70 cents *per diem* the cooly might be able to earn dollar a day in mines. If this were so their object would not be achieved and he is sure no one desires competition of this description.

Major SLEE thinks that Chinese miners have already reduced wages by 20 per cent.

Major STEVENS thinks it would be very difficult to get correct information on this point. He says Chinese labourers on mines work largely on the yardage system and on contract under kapalas who gave them various allowances.

Mr. GRABURN desires an expression of opinion with regard to the number of days and on what days work should be stopped on estates. He says that at the meeting of the Batang Padang District Planters' Association held recently Mr. Stewart put forward some interesting figures which showed that if tapping was stopped on Sundays they would be able to employ about 17 per cent. more of their labour and that if tapping was stopped on Saturdays they could employ about 20 per cent. more. He thinks it most desirable that something should be done to reduce the number of working days so as to enable employers to retain more of their labourers.

Mr. CUMMING says the whole question can be whittled down to the fact that matters of this description must be left to the discretion of those who administer the estates. He is of opinion that the only men who could arrange such matters would be managers themselves.

Major SLEE thinks it is obviously to the advantage of an estate to work every day in a week. He points out that there are certain general charges on estates which remain the same whether the cooly works one day or 30 days in a month. On the

other hand, estates which have not sufficient money to enable them to employ their labourers for a full month's work may have to reduce the number of working days. It all depends upon the financial position of companies.

Major STEVENS agrees with the logical conclusions of the previous speaker.

Mr. LATHAM thinks it will be very hard on coolies if their wages are reduced and then also the number of working days.

4.—CROP RESTRICTION.

Mr. CUMMING states that he has nothing definite to put before the meeting on this subject. He refers to the Duncan Committee which met in Kuala Lumpur on 19th December last and which held another meeting on 29th December last when the Committee's resolutions were passed and recommendations confirmed. He understands that a Sub-Committee of the Duncan Committee met yesterday in Singapore and is sitting again to-day. He is convinced that the matter could not be in better hands and is sure as soon as a decision is arrived at the planting community will be notified.

5.—PLANTERS IN DISTRESS.

Mr. CUMMING believes it is unfortunately the fact that distress prevails among a number of planters owing to the rubber crisis and he fears that matters may become much worse ere long.

The SECRETARY submits the following summary of proceedings of the Planters' Unemployment Committee which was appointed at the suggestion of the Incorporated Society of Planters by the Standing Committee of the Planters' Association of Malaya:

"PLANTERS' UNEMPLOYMENT COMMITTEE.

"At a recent meeting of the Standing Committee of the Planters' Association of Malaya, it was resolved to appoint the Hon. Mr. Wm. Duncan, Major A. B. Slee, Messrs. C. Bradbery and C. B. Graburn an Organizing Committee to deal with matters relating to planters in distress.

"The Committee met yesterday and decided to invite the following to become members of the Planters' Unemployment Committee:

(*a*) Chairman of all Planters' Associations in the Malaya Peninsula;

(*b*) A representative of the Incorporated Society of Planters;

(*c*) The Hon. Mr. W. Lowther Kemp;
,, ,, ,, H. P. Clodd;
Mr. C. D. Mathewson.

"The objects of the Committee are to collect funds and to grant relief to necessitous persons of European birth who are or have been employed upon rubber estates in Malaya and who have lost their employment in consequence of the present rubber crisis and general trade depression and to grant relief to the dependents of such persons.

"The Committee propose:

(1) To take steps to apply to the Malay States Information Agency for the sum of $100,000 of the balance of £36,849 15*s*. which stood to the credit of the Federated Malay States War Relief Fund, Scheme No. 2, on 30th September, 1920;

(2) To appeal to directors, secretaries and agents of rubber companies both in Malaya and at Home and to others for donations to the Committee's funds;

(3) To appeal to all planters in employment to contribute to the Fund One Day's Pay;

(4) To ask Government to recognize the Committee; to subscribe substantially to its funds, and to offer employment to unemployed planters as occasion and opportunity offer;

(5) To use their influence with directors, secretaries and agents of rubber estates and employers of European labour to do their utmost to retain during the crisis the services of all Europeans employed by them;

(6) To establish a Central Registry of

(*a*) Appointments vacant;

(*b*) Persons needing employment.

"It was further decided to call a meeting of the substantive Committee on Thursday, 13th January, 1921, at 11.30 a.m. to discuss ways and means.

"(Sd.) C. WARD-JACKSON,
"*Hon. Secretary.*

"KUALA LUMPUR,
"*30th December, 1920.*"

Major HUXTABLE points out that there is and will be unemployment and distress among ex-Service men and he suggests that a representative of the United Services Great War Association should be co-opted a member of the Planters' Unemployment Committee.

Mr. BRADBERY agrees with Major Huxtable and promises to bring up the matter at the meeting of the Committee which is to be held on the morrow.

Major STEVENS thinks the omission to which Major Huxtable refers is a very serious one which should be rectified at once.

Mr. CUMMING is sure that the Committee will be pleased to co-opt one or more members of the United Services Great War Association. He calls attention to the fact that the Committee's proposals and the constitution are purely tentative and that the fact that the United Services Great War Association has not already been invited to serve on the Committee is quite accidental and will be rectified immediately.

The SECRETARY submits the following letter from the Hon. Mr. William Duncan, together with copy of a letter sent by Mr. Duncan to the Acting Chief Secretary to the Government:

"DEAR SIR,

"In regard to unemployment of Europeans I have forwarded to Government a copy of the minutes of the meeting of the formative committee held at Kuala Lumpur on 29th December with a covering letter of which I enclose a copy. If the best results of efforts, to alleviate the hardships, which planters and their dependents are likely to suffer are to be achieved it is essential that overlapping be avoided and it was with the object of placing Government in possession of our aims that I wrote to them. I may have a reply to my letter before the 12th, and, if so, I shall forward it to you but, if not, I think that the meeting should be told what we have done so far. If they confirm our action we can go on. If not, other means of rendering assistance must be devised.

"Yours, etc.,

"(Sd.) WM. DUNCAN."

"SIR,

"I have the honour to attach copy of the minutes of a meeting held at Kuala Lumpur on 29th December, 1920. At the time of the meeting the members of the Organizing Committee were in uncertainty as to the constitution of the Federated Malay States War Relief Fund and as to the feasibility of procuring a part of the funds. A good deal of the money which went to make up the above Fund was subscribed by planters in Malaya and the Committee trusts that Government, if they sympathize with the objects stated, will assist in procuring a substantial part of the balance at the credit of the Fund and also to give some assistance from Government funds.

"I have, etc.,

"(Sd.) WILLIAM DUNCAN,

"*Chairman, Organizing Committee.*

"THE ACTING UNDER SECRETARY,"

Mr. R. M. LATHAM would like to suggest that those who have any information with regard to the number of Europeans out of employment, and were likely to be out of employment, should send that information on to their Association or the Committee as that would help the Committee a good deal. At a Committee meeting of the Lower Perak Planters' Association they decided to send out circulars to all their members asking them for the following information with regard to planters' distress:

(1) Had they any assistants under notice or already discharged owing to the present crisis;
(2) The names of such persons;
(3) Whether married or single;
(4) Children, if any, together with age;
(5) Length of planting experience whether rubber or coconut;
(6) Whether a returned army man;
(7) Previous occupation and qualifications.

Mr. CUMMING thinks the suggestion sound and one which will be helpful to the Committee.

Mr. REEVE-TUCKER believes that it would be a good thing if each individual subscription to the suggested One Day's Pay Fund could be earmarked so that if any balance remains when the fund is wound up subscriptions might be returned to individual donors.

Major SLEE says he will be pleased to pass this on to the Committee.

Mr. CUMMING asks whether this meeting approves in principle the Committee's proposed scheme as submitted.

The scheme as suggested is unanimously agreed to.

6.—RUBBER EXHIBITION, 1921.

The SECRETARY states that at the last meeting of the Planters' Association of Malaya held in September Messrs. J. Bruce, T. H. Menzies and H. L. Carter were elected as the Exhibition Sub-Committee. Mr. F. Clyde Jeavons also joined the Committee as representing the Local Committee of the Rubber Growers' Association. The Committee communicated with the Government to the effect that the Planters' Association of Malaya desire Government to undertake the collection and preparation of an exhibit and stated that the Standing Committee were prepared to take steps for the collection of a sum not exceeding £1,000 towards the expenses of participating in the Exhibition. He says no reply has yet been received from Government, but he believes Government has already in course of preparation by the Agricultural Department an exhibit for the Exhibition. He says that at a recent meeting of the Standing Committee he was instructed to address

all Constituent Associations inviting estates to contribute to the Exhibition Account on the basis of two cents an acre under cultivation.

Mr. CUMMING thinks the Exhibition will prove to be extremely useful; but having regard to the difficult times he does not think that there is any likelihood of a large sum of money being collected from local companies.

Mr. SWINTON says the matter was brought up before the Negri Sembilan Planters' Association and the opinion expressed generally was that nothing can be done locally as managers of estates had no power to contribute money to the Exhibition Account.

Messrs. Reeve-Tucker, Kennaway and Armstrong intimate that their respective Associations, namely, Klang, Ulu Selangor and Kuala Lumpur District Planters' Associations are of the same opinion.

Major STEVENS is sure that estates would be prepared to present rubber to the Exhibition.

7.—REWARDS FOR EX-SERVICE MEN.

Mr. CUMMING explains that this item has been placed upon the agenda because at the meeting of the Association which was held in Johore in September last a Committee was appointed to enquire into the subject. He says the Report of the Committee has been circulated and published and all are no doubt aware that Government has decided not to act upon the Committee's recommendations. He is of opinion that no useful purpose would be served by carrying the matter any further, and all that remains for this Association now to do is to pass a vote of thanks to Mr. Huson for the tremendous amount of work he did and time he devoted to the Report and to the gentlemen who served on Mr. Huson's Committee.

Mr. KENNAWAY proposes a vote of thanks to Mr. Huson and the Rewards Committee for ex-Service men for their excellent Report.

Mr. GRABURN seconds and the vote of thanks is carried unanimously.

8.—LICENSING OF COPRA DEALERS.

The SECRETARY explains that this item has been included on the agenda by instructions of the Standing Committee. He says that a deputation consisting of the Hon. Mr. Wm. Duncan and Messrs. J. Bruce, H. J. Gillespie, W. R. C. Gray and J. French met the Chief Secretary a few months ago. He believes that the result of the deputation was satisfactory and he suggests that the Chairman call upon Mr. Gray to make a statement to the meeting.

Mr. GRAY says that the deputation to which the Secretary refers duly waited upon the Chief Secretary who accorded it a very sympathetic hearing. Recently he had seen a Bill which he trusts in due time will become an Enactment which should effect all they desire in the matter of the licensing of copra dealers. The Lower Perak Planters' Association is of opinion that nothing will now be gained by writing to Government further, but Mr. Duncan has been approached with the suggestion that he should talk over the matter with the Chief Secretary when opportunity offers.

9.—REGISTRATION OF DRESSERS AND MOTOR AMBULANCES.

Mr. KEPPEL-POWIS requests to be informed what has been done in reference to the resolutions which were passed at the last meeting of the Planters' Association of Malaya on the above subjects.

The SECRETARY replies that the resolutions were duly forwarded to Government but that no reply has yet been received. He promises that these matters shall not be forgotten.

10.—GENERAL.

Mr. BRADBERY asks permission to refer again to labour matters. He says he had an interview with the General Adviser of the Johore Government a few days ago and this official had assured him that the Johore Public Works Department authorities would automatically reduce the rate of wages paid to their labourers as the price of rice came lower. He says that until recently the Johore Public Works Department coolies were paid 35 cents rice allowance and that this allowance has now been reduced to 10 cents.

With a vote of thanks to the Chair the meeting terminates at 12.45 p.m.

C. WARD-JACKSON,
Secretary.

Abstract of Meteorological Readings in the various districts of Malaya for the month of October, 1920.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bahru	...	143.69	80.7	88.61	73.80	14.80	76.2	.818	73.2	78.	...	8.83	1.83
Pahang, Kuala Lipis	...	...	80.7	88.03	75.06	12.97	75.4	...	...	...	...	18.55	2.95
Johore, Johore Bahru	...	...	...	87.82	73.38	14.44	...	...	...	...	...	6.53	1.67
Singapore, Kandang Kerbau ...	1007.4	161.0	83.1	88.8	74.3	14.5	77.7	.874	...	77.	Calm	9.68	3.14
Malacca, Durian Daun ...	1010.6	133.0	81.0	87.0	73.0	14.0	77.0	.899	...	84.	N.E. & N.W.	6.92	1.57
Negri Sembilan, Seremban ...	...	150.7	79.8	86.6	70.2	16.4	76.2	.836	73.6	81.8	S.W.	7.79	2.16
,, Kuala Pilah ...	...	153.0	81.4	90.2	...	...	78.4	.918	76.7	87.4	...	4.60	.85
,, Port Dickson ...	...	...	81.0	88.3	73.2	15.1	76.6	.858	75.2	80.7	...	7.81	2.11
Selangor, Kuala Lumpur ...	29.804	150.7	81.7	89.9	72.0	17.9	78.3	.896	75.7	82.	S.E.	12.62	2.99
,, Klang	...	...	80.0	83.8	74.7	9.1	76.0	...	...	...	...	9.10	1.82
,, Kuala Selangor ...	...	...	...	89.2	74.6	14.6	...	...	...	...	...	4.54	1.53
,, Rawang	...	...	...	90.0	73.8	16.2	...	...	...	...	...	6.04	1.85
Perak, Telok Anson	...	...	81.59	91.0	70.0	21.0	77.50	.890	...	83.	...	8.03	1.92
,, Ipoh	...	114.0	78.47	91.0	68.0	23.0	76.67	.894	...	93.	...	14.41	4.29
,, Taiping	...	...	81.00	93.0	70.0	23.0	75.93	.829	73.48	78.	...	11.41	2.51
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	32.16	6.88
,, Parit Buntar	...	...	80.49	92.0	71.0	21.0	76.45	.857	...	82.	...	7.16	1.57
Penang, George Town	1008.9	139.45	85.9	86.9	71.7	15.2	77.6	.900	68.8	83.4	N.W.	2.54	1.69
Kedah, Alor Star	...	...	...	...	...	...	...	...	...	...	...	8.62	2.11
Perlis, Kangar	...	...	...	86.96	73.19	13.77	...	...	...	...	...	12.42	2.33

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District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bahru	...	142.91	79.8	86.56	74.10	12.46	76.2	.832	73.7	81.	...	24.81	5.37
Pahang, Kuala Lipis	...	...	80.86	87.60	74.60	13.00	53.18	...	...	...	...	14.75	1.35
Johore, Johore Bahru	...	...	...	87.40	73.76	13.64	...	...	...	...	...	17.27	2.14
Singapore, Kandang Kerbau ...	1008.4	160.0	82.6	88.8	74.8	14.0	77.9	.892	...	79.	Calm	12.55	2.43
Malacca, Durian Daun	1009.7	133.0	81.0	87.0	74.0	13.0	77.0	.901	...	81.	N.E.	11.10	2.74
Negri Sembilan, Seremban ...	...	146.3	79.4	87.3	73.5	13.8	76.5	.846	74.5	85.6	N.W.	11.62	1.37
,, Kuala Pilah ...	...	157.5	82.1	89.7	...	...	79.07	.944	77.6	88.0	...	6.27	1.88
,, Port Dickson	...	108.4	81.6	88.2	73.8	14.4	73.6	.872	74.9	79.2	...	9.05	1.63
Selangor, Kuala Lumpur ...	29.810	152.8	80.5	91.6	73.7	17.9	77.0	.866	74.7	83.	S.W.	9.72	2.07
,, Klang	...	...	79.6	83.4	74.6	8.8	76.2	...	...	...	...	9.75	1.81
,, Kuala Selangor ...	...	...	...	89.6	74.5	15.1	...	...	...	...	...	5.77	1.25
,, Rawang	...	...	...	88.0	73.6	15.2	...	...	...	...	...	7.68	2.04
Perak, Telok Anson	...	...	81.11	91.0	71.0	20.0	77.8	.910	...	87	...	13.26	3.07
,, Ipoh	...	109.	80.27	92.0	70.0	22.0	76.84	.878	...	87	...	28.26	3.18
,, Taiping	...	...	80.57	93.0	68.0	25.0	76.22	.848	73.91	82	...	9.99	1.92
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	28.89	6.18
,, Parit Buntar	...	...	81.04	90.0	73.0	17.0	77.17	.882	...	85	...	11.22	1.92
Penang, George Town	1019.5	107.4	81.9	87.0	72.0	15.0	76.3	.875	69.6	79.5	N.E.	9.35	2.24
Kedah, Alor Star	...	...	...	...	...	...	...	...	...	...	...	6.48	1.04
Perlis, Kangar	...	...	...	86.93	73.33	13.60	...	...	...	...	...	6.94	1.17

Abstract of Meteorological Readings in the various districts of Malaya for the month of December, 1920.

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			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bahru	...	140.0	79.1	87.32	73.35	13.96	75.6	.818	73.2	82.	...	37.42	12.23
Pahang, Kuala Lipis	...	...	80.47	89.74	73.58	16.16	75.85	...	...	...	...	5.74	1.59
Johore, Johore Bahru	...	...	...	88.62	73.09	14.53	...	...	...	...	...	4.83	1.84
Singapore, Kandang Kerbau ...	1008.6	161.0	83.4	89.7	74.5	15.2	77.3	.848	...	75.	Calm	4.73	1.65
Malacca, Durian Daun	1010.2	133.0	81.0	88.0	73.0	15.0	78.0	.895	...	83.	N.E.	2.57	.55
Negri Sembilan, Seremban ...	...	149.2	80.1	86.4	71.3	15.1	77.3	.882	75.3	85.5	N.E.	1.83	.82
,, Kuala Pilah ...	...	158.0	81.1	90.0	...	...	79.3	.953	77.7	87.2	...	3.07	1.22
,, Port Dickson	...	...	80.2	86.5	71.4	15.1	74.3	...	...	...	...	4.76	1.49
Selangor, Kuala Lumpur ...	29.809	154.7	81.9	90.7	71.8	18.9	78.2	.880	76.1	81.0	...	10.96	2.16
,, Klang	...	...	80.7	84.2	74.7	9.5	76.2	...	...	...	...	4.02	2.31
,, Kuala Selangor ...	...	...	...	89.6	74.4	15.2	...	...	...	...	...	2.40	.55
,, Rawang	...	...	...	91.0	73.2	17.8	...	...	...	...	...	3.39	1.38
Perak, Telok Anson	...	...	81.56	91.0	70.0	21.0	77.55	.890	...	83.	...	2.32	.94
,, Ipoh	...	111.0	81.47	91.0	72.0	19.0	76.81	.861	...	80.	...	6.96	1.45
,, Taiping	...	...	81.01	93.0	70.0	23.0	75.71	.820	73.80	78.	...	10.94	1.53
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	16.88	2.55
,, Parit Buntar	...	...	81.00	93.0	70.0	23.0	76.82	.868	...	82.	...	5.74	1.14
Penang, George Town	1008.7	165.0	81.19	86.32	71.77	15.15	77.24	.879	68.0	82.73	N.W.	10.07	2.87
Kedah, Alor Star	...	...	...	...	...	...	...	...	...	...	...	8.44	1.35
Perlis, Kangar	...	...	...	85.58	72.23	13.35	...	...	...	...	...	8.08	1.96